

Q. Find K for which Roots of Eqⁿ.

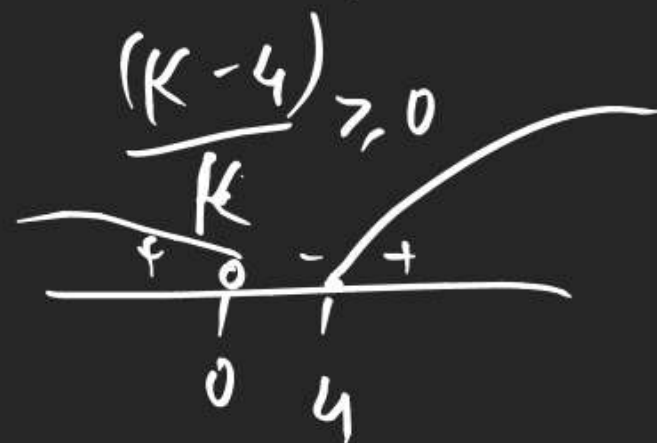
$Kx^2 + Kx + 1 = 0$ are less than 3.

less than K & Gr than K dono Pr Summe.
Profile Kunn Kat ti h

① Corr. f x h $\rightarrow f(x) = x^2 + x + \frac{1}{K}$

① $D \geq 0$

$$(1)^2 - 4 \times 1 \times \frac{1}{K} \geq 0$$



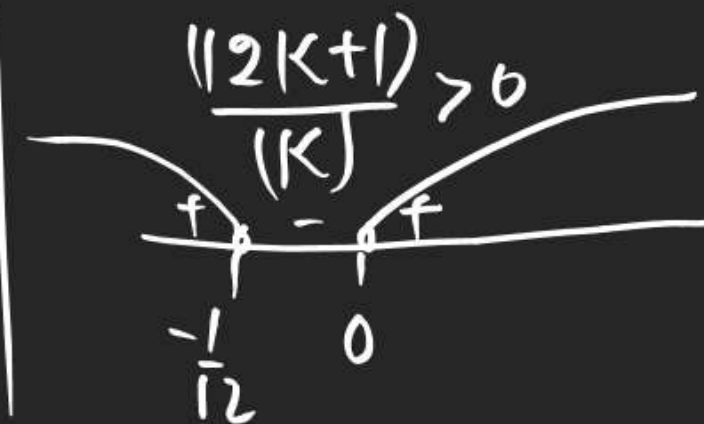
② $-\frac{b}{2a} < 3$

$$\frac{-1}{2 \times 1} < 3$$

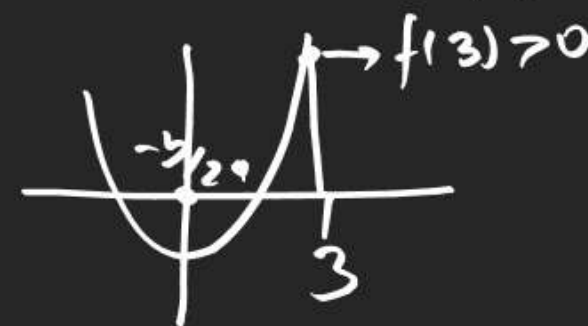
$$-\frac{1}{2} < 3$$

③ $f(3) > 0$

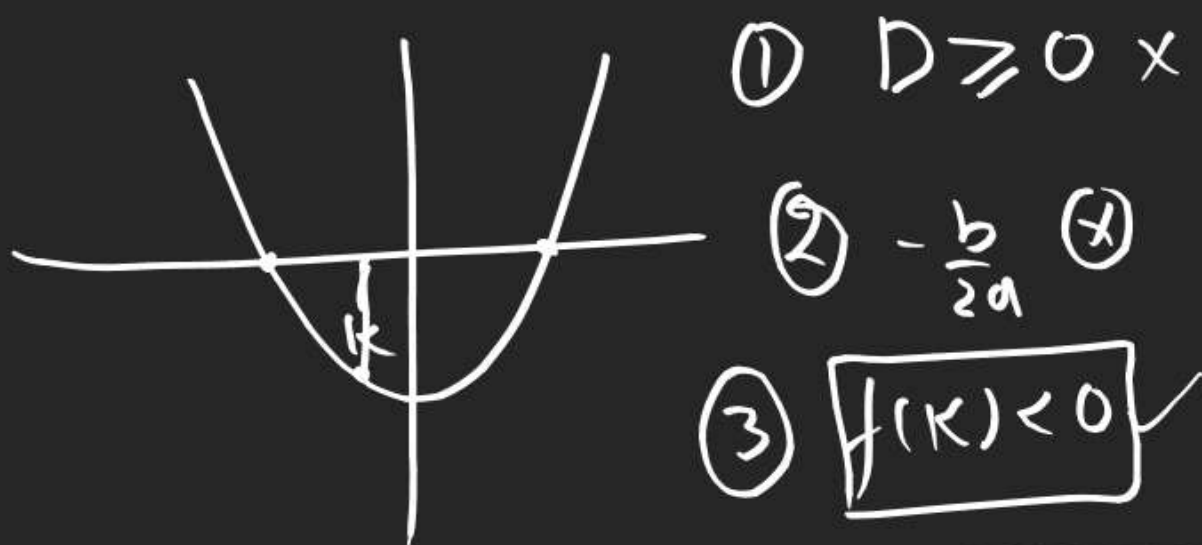
$$9 + 3 + \frac{1}{K} > 0$$



$$K \in (-\infty, -\frac{1}{12}) \cup [4, \infty)$$



Profile 2 When Both Roots of $ax^2+bx+c=0$
Easy are opp. side of k .

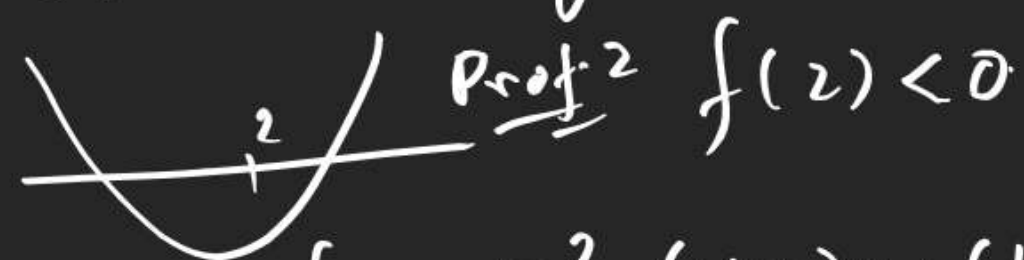


only One condⁿ follows $\rightarrow$ $f(k) < 0$

DROPPER

Q. Find k if Roots of Eqⁿ.

$x^2 - (k+1)x + (k^2+k-8) = 0$ are at
 either Side of 2.



$$f(x) = x^2 - (k+1)x + (k^2+k-8)$$

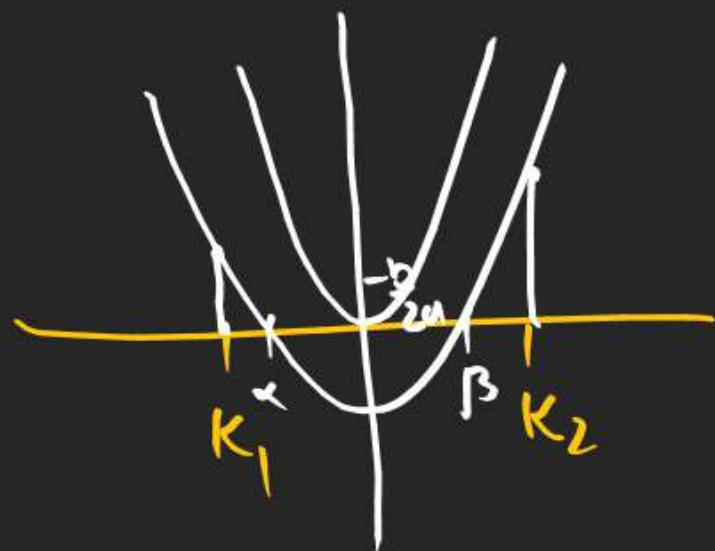
$$f(2) = 4 - 2(k+1) + k^2 + k - 8 < 0$$

$$k^2 - k - 6 < 0$$

$$(k-3)(k+2) < 0$$

$$\boxed{-2 < k < 3}$$

Profile 3 When Both Roots of $ax^2+bx+c=0$ are confined betⁿ (k_1, k_2)



$$(1) D \geq 0$$

$$(2) k_1 < -\frac{b}{2a} < k_2$$

$$(3) f(k_1) > 0 \text{ \& } f(k_2) > 0$$

3 condⁿ for Profile 3

$$a \in \left(-\frac{11}{3}, -2\sqrt{2}\right)$$

Q. If $x^2+ax+2=0$ has 2 Roots $< 2\beta$.
($\neq \beta$) Where $\alpha, \beta \in (0, 3)$ then find a ?

Pro³ (corr. fcn $\rightarrow f(x) = x^2+ax+2$

$$(1) D \geq 0$$

$$a^2 - 4 \times 2 \geq 0$$

$$(a - 2\sqrt{2})(a + 2\sqrt{2}) \geq 0$$

$$\boxed{a < -2\sqrt{2}} \vee a > \boxed{2\sqrt{2}}$$

$$(3) f(0) > 0$$

$$2 > 0$$

$$(2) 0 < -\frac{a}{2} < 3$$

$$0 < -a < 6$$

$$\underline{0 > a > -6}$$

$$f(3) = 9 + 3a + 2 > 0$$

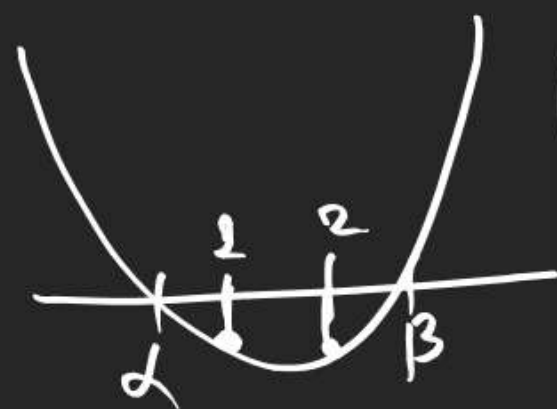
$$3a > -11$$

$$a > -\frac{11}{3} \quad (2.6)$$



Q Find all values of K for which one Root of Eqⁿ $(K-5)x^2 - 2Kx + (K-4) = 0$ is smaller than 1 but exceeds 2. $K_1 = 1, K_2 = 2$

$$f(x) = x^2 - \frac{2K}{(K-5)}x + \frac{K-4}{K-5}$$



$$\textcircled{1} f(1) < 0$$

$$1 - \frac{2K}{K-5} + \frac{K-4}{K-5} < 0$$

$$\frac{K-5 - 2K + K-4}{(K-5)} < 0 \Rightarrow \frac{-9}{K-5} < 0$$

$$\frac{9}{(K-5)} > 0$$

5

$$K \in (5, 24)$$

Profile 4 When Both Roots of $ax^2 + bx + c = 0$ contains $\{K_1, K_2\}$



$$\textcircled{1} D > 0^x$$

$$\textcircled{2} -\frac{b}{2a}$$

$$\textcircled{3} \begin{cases} f(K_1) < 0 \\ \Delta f(K_2) < 0 \end{cases}$$

$$\textcircled{2} f(2) < 0 \Rightarrow 4 - \frac{4K}{K-5} + \frac{K-4}{K-5} < 0$$

$$\frac{4K-20 - 4K + K-4}{(K-5)} < 0 \Rightarrow \frac{(K-24)}{(K-5)} < 0$$

$$\frac{+ \sqrt{-6}}{5 \quad 24}$$

Q Find value of a for which one root of

$$Eq^{\wedge}(a-5)x^2 - 2ax + a - 4 = 0 \text{ is}$$

Smaller than 1 & gr. than 2.

Same as Prev. qd $\rightarrow a \in (5, 24)$

Q P.T. values of (k) for which

$$2x^2 - 2(2k+1)x + k(k+1) = 0 \text{ has}$$

one root less than (k) & other

gr. than k if $k > 0$ & $k < -1$.



$$f(x) = 2x^2 - 2(2k+1)x + k(k+1)$$

$$f(k) < 0$$

$$2k^2 - 2(2k+1)k + k(k+1) < 0$$

$$2k^2 - 4k^2 - 2k + k^2 + k < 0$$

$$-k^2 - k < 0$$

$$k^2 + k > 0$$

$$(k)(k+1) > 0$$

$$\underline{k < -1 \cup k > 0}$$

Q find value of a for which roots

form.
Asked

$$\underline{x^2 - 2x - a^2 + 1 = 0} \text{ lies bet}^n.$$

Q5 Roots of $\underline{x^2 - 2(a+1)x + a(a-1) = 0}$

2.2 Q vad

2 Q vad
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hogi

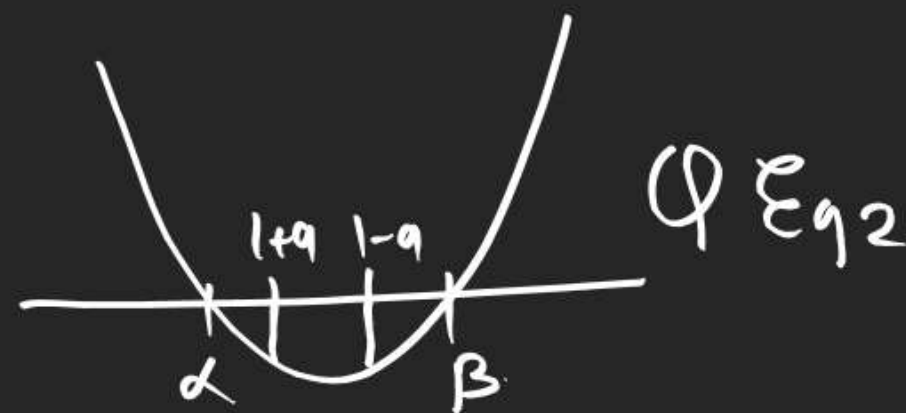
Q E_{q1} $\rightarrow x^2 - 2x - a^2 + 1 = 0$

$$\Rightarrow (x^2 - 2x + 1) - a^2 = 0$$

$$\Rightarrow (x-1)^2 - a^2 = 0$$

$$\Rightarrow (x-1-a)(x-1+a) = 0$$

$$x = 1+a, 1-a$$



Q E_{q2}

Proof

$$f(x) = x^2 - 2(a+1)x + a(a-1)$$

$$f(1+a) < 0$$

$$(1+a)^2 - 2(1+a)(1+a) + a(a-1) < 0$$

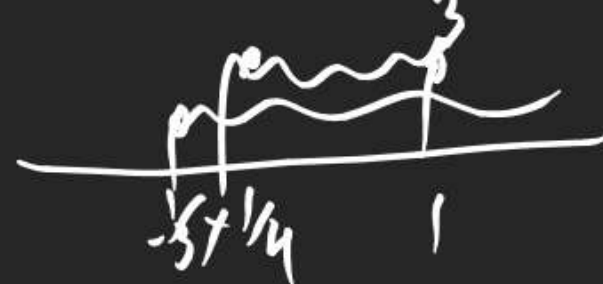
$$-(1+a)^2 + a(a-1) < 0$$

$$-a^2 - 2a - 1 + a^2 - a < 0$$

$$-3a - 1 < 0$$

$$3a > -1$$

$$a > -\frac{1}{3}$$



$$f(1-a) < 0$$

$$(1-a)^2 - 2(1+a)(1-a) + a(a-1) < 0$$

$$(1-a)\{1-a-2(1+a)-a\} < 0$$

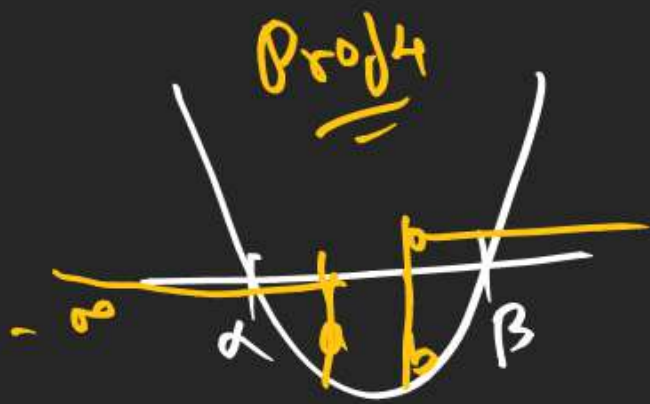
$$(1-a)(-1-4a) < 0$$

$$(a-1)(4a+1) < 0$$

$$-\frac{1}{4} < a < 1$$

$$a \in \left(-\frac{1}{4}, 1\right)$$

Q If $b > a$, then P.T. Eqn $(x-a)(x-b)-1=0$
 IIT has one Root in $(-\infty, a)$ & other in (b, ∞)



$$f(x) = (x-a)(x-b)-1$$

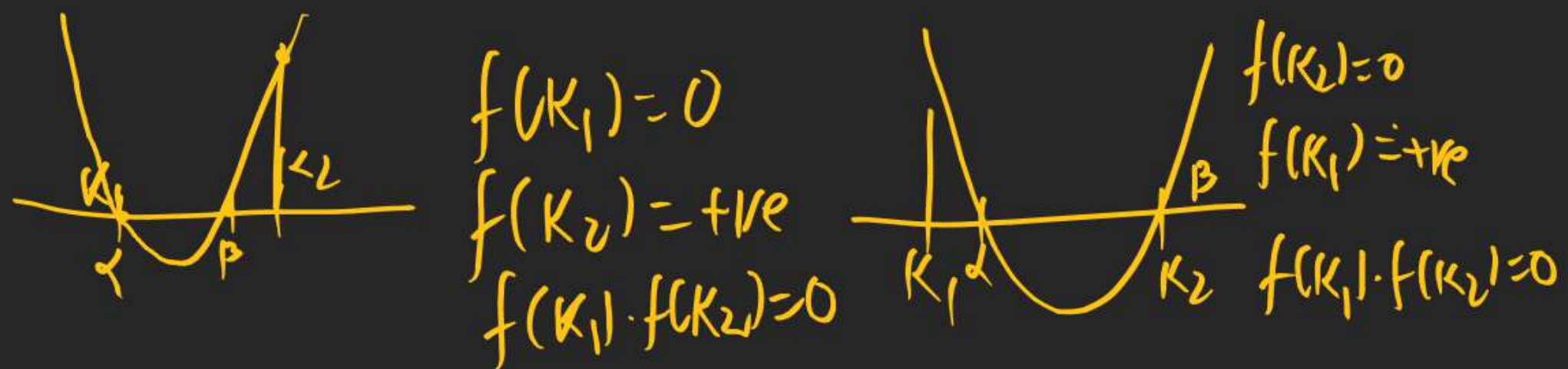
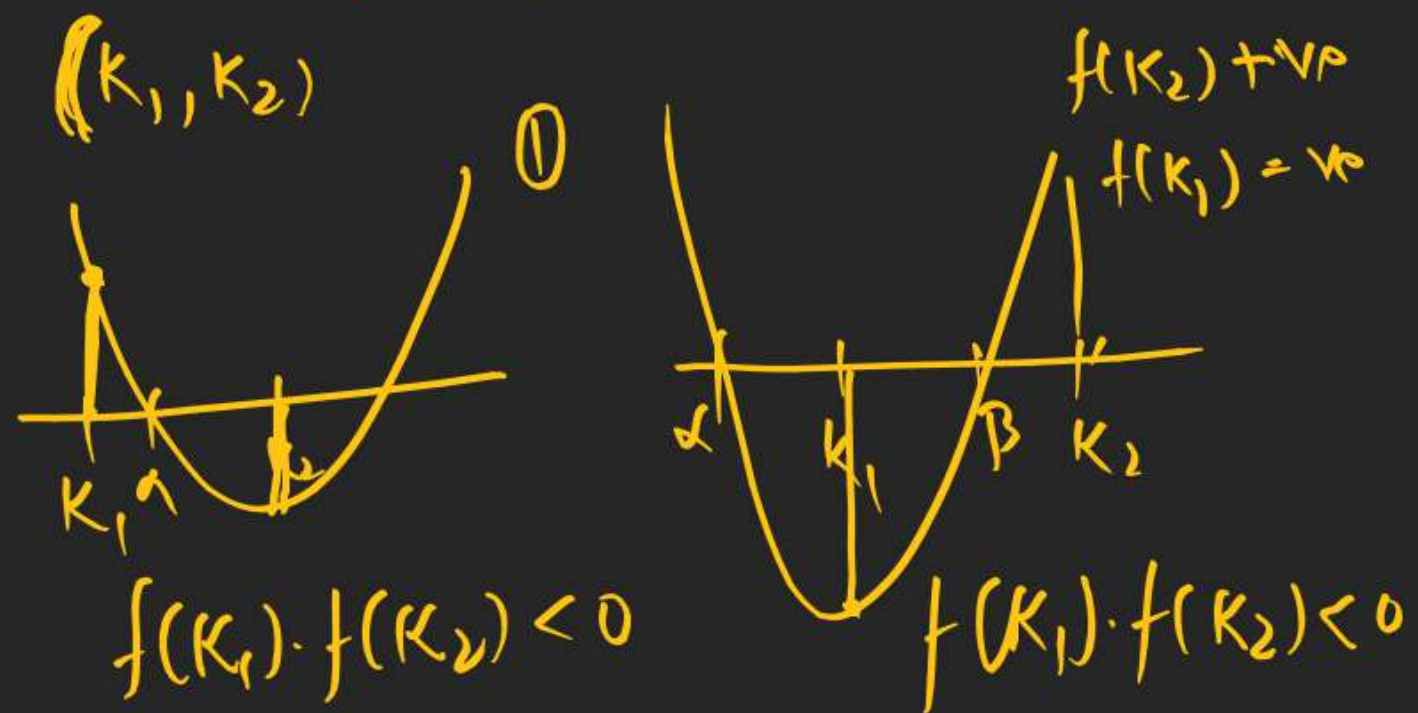
If given condⁿ in
 true then $f(a) < 0$
 & $f(b) < 0$

$$f(a) = 0 - 1 < 0$$

$$f(b) = 0 - 1 < 0$$

J.P.

Profile 5 When Exactly one Root of
 $ax^2+bx+c=0$ lies in Interval
 (K_1, K_2)



Q. Find all values of a so that Eqⁿ.

$x^2 + (3-2a)x + a = 0$ has exactly

One Root in $(-1, 2)$.

fix condⁿ $\rightarrow f(-1)f(2) < 0$

$$f(x) = x^2 + (3-2a)x + a$$

$$(1 - 3 + 2a + a)(4 + 6 - 4a + a) < 0$$

$$(3a - 2)(-3a + 10) < 0$$

$$(3a - 2)(3a - 10) > 0$$

$$a < \frac{2}{3} \vee a > \frac{10}{3}$$

$$a \in (-\infty, \frac{2}{3}] \cup [\frac{10}{3}, \infty)$$

$(-1, 2)$

End condⁿ

$$f(-1) = 0 \text{ Accept}$$

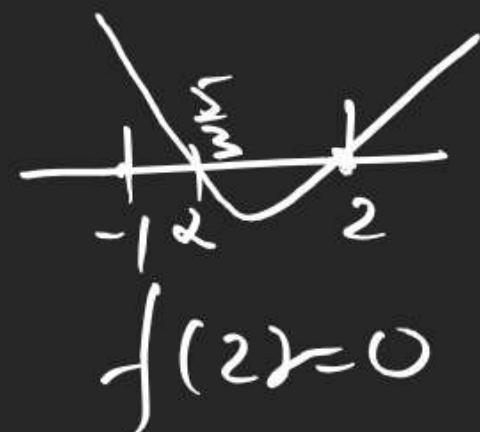
$$3a - 2 = 0$$

$$a = \frac{2}{3}$$

$$x^2 + (3-2a)x + a$$

$$-\beta = a = \frac{2}{3}$$

$$\beta = -\frac{2}{3} \in (-1, 2)$$



$$-3a + 10 = 0 \Rightarrow a = \frac{10}{3}$$

$$x^2 + (3-2a)x + a$$

$$2\alpha = a = \frac{10}{3}$$

$$\alpha = \frac{5}{3} \in (-1, 2) \text{ So check}$$

accept

Q Find a for which eqⁿ $x^2 + 2(a-1)x + (a+5) = 0$
has at least one +ve Root.

$$a \in (-\infty, -5)$$

$$f(x) = x^2 + 2(a-1)x + (a+5)$$

Ek root 0 K Right me hai



Proof 2

$$f(0) < 0$$

$$a+5 < 0$$

$$a < -5$$



Proof 1
 $D \geq 0$

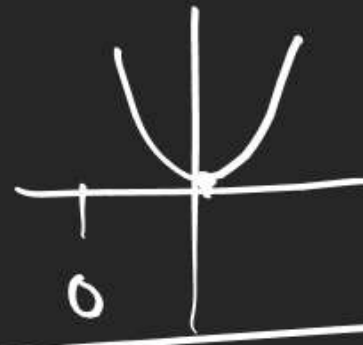
$$4(a-1)^2 - 4(a+5) \geq 0$$

$$a^2 - 2a + 1 - a - 5 \geq 0$$

$$a^2 - 3a - 4 \geq 0$$

$$(a-4)(a+1) \geq 0$$

$$a \leq -1 \cup a \geq 4$$



$$a \in (-\infty, -5]$$

$$(2) -\frac{b}{2a} > 0$$

$$-\frac{2(a-1)}{2} > 0$$

$$-a+1 > 0$$

$$a < 1$$

$$f(0) > 0$$

$$a+5 > 0$$

$$a > -5$$

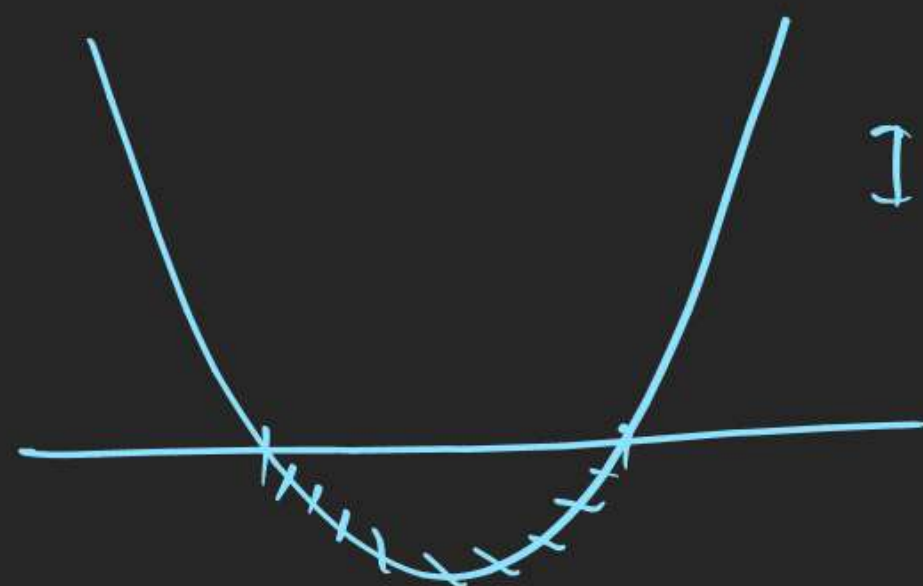


$$-5$$

$$4$$

Q Find P for which Inequality

1. $x^2 - 2Px + 3P + 4 \leq 0$ Satisfying for at least 1 Real x .



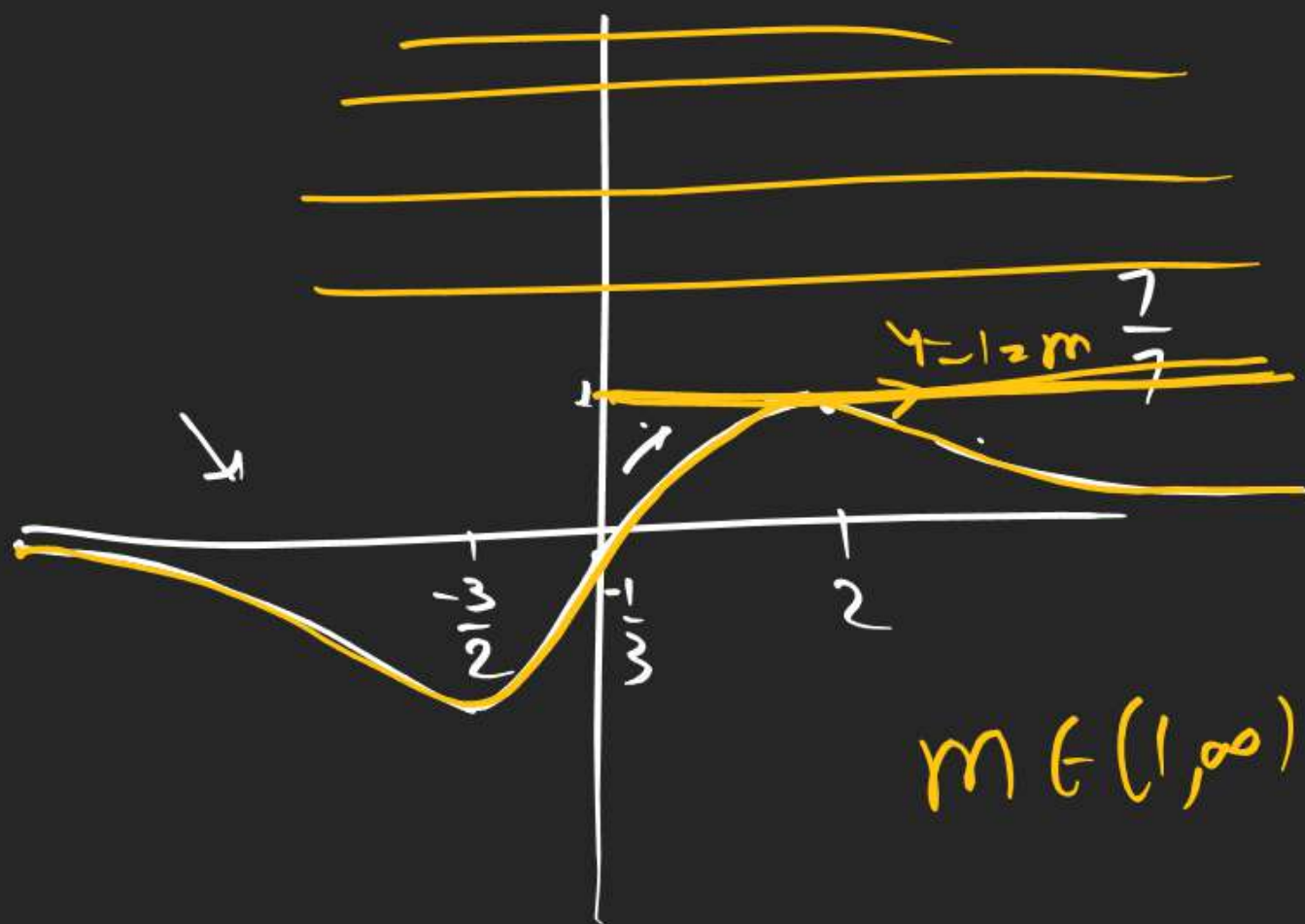
Interval (m, n)

$$D > 0$$

$$4P^2 - 4(3P + 4) > 0$$

Q Find m for which Inequality $mx^2 - 4x + (3m+1) > 0$

Satisfied for all $x > 0$



$$mx^2 + 3m > 4x - 1$$

$$m(x^2 + 3) > 4x - 1$$

$$m \Rightarrow \frac{4x-1}{x^2+3}$$

$D_f \rightarrow x \in \mathbb{R}$

$$f'(x) = \frac{(x^2+3)4 - (4x-1)(2x)}{(x^2+3)^2}$$

$$= \frac{-4x^2 + 2x + 12}{(x^2+3)^2} - \frac{2(2x^2 - x(-6))}{(x^2+3)^2}$$

$$= \frac{-2(2x+3)(x-2)}{(x^2+3)^2}$$

$$f(-\infty) = \lim_{x \rightarrow -\infty} \frac{4x-1}{x^2+3} = \frac{4}{2x} = 0$$